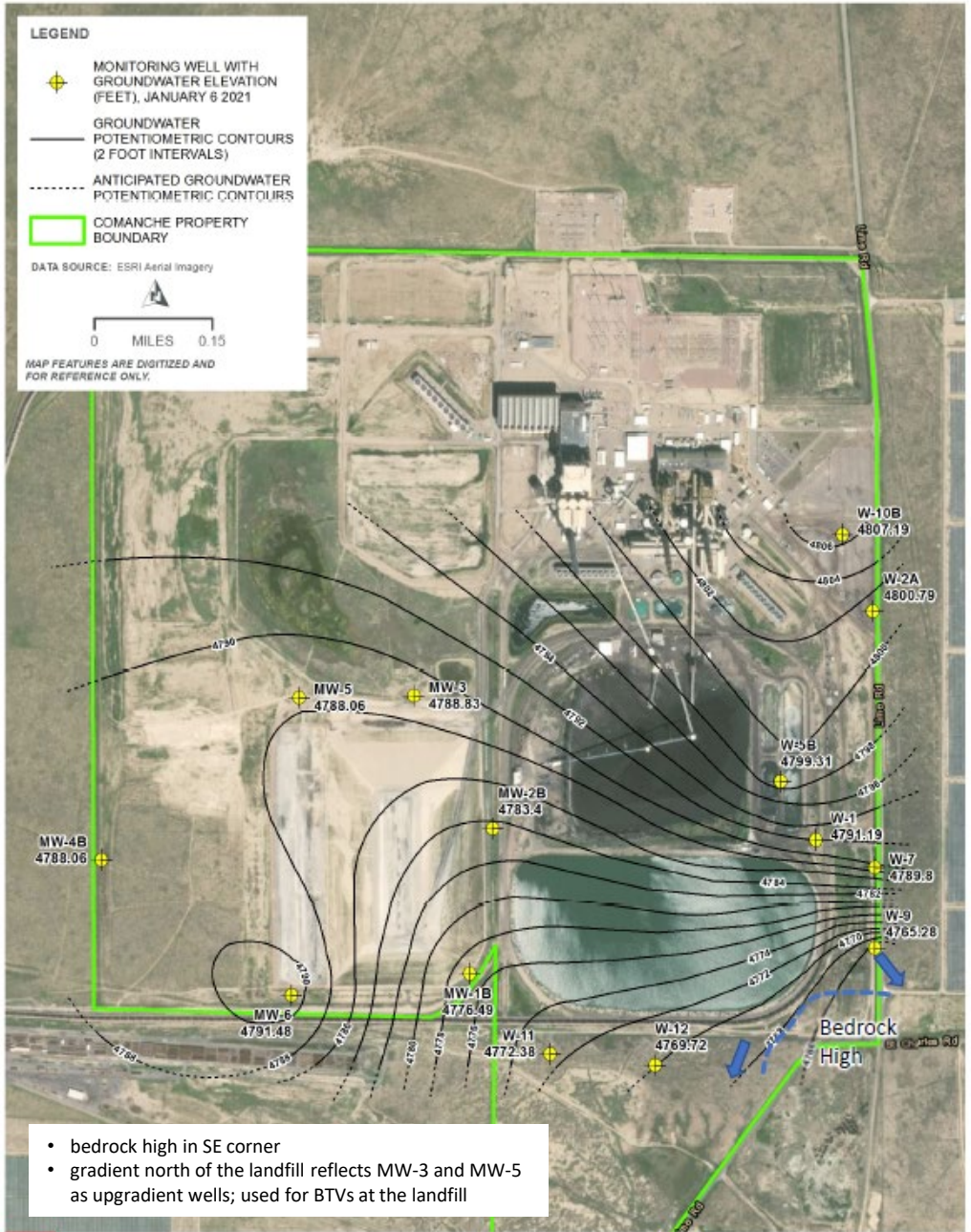
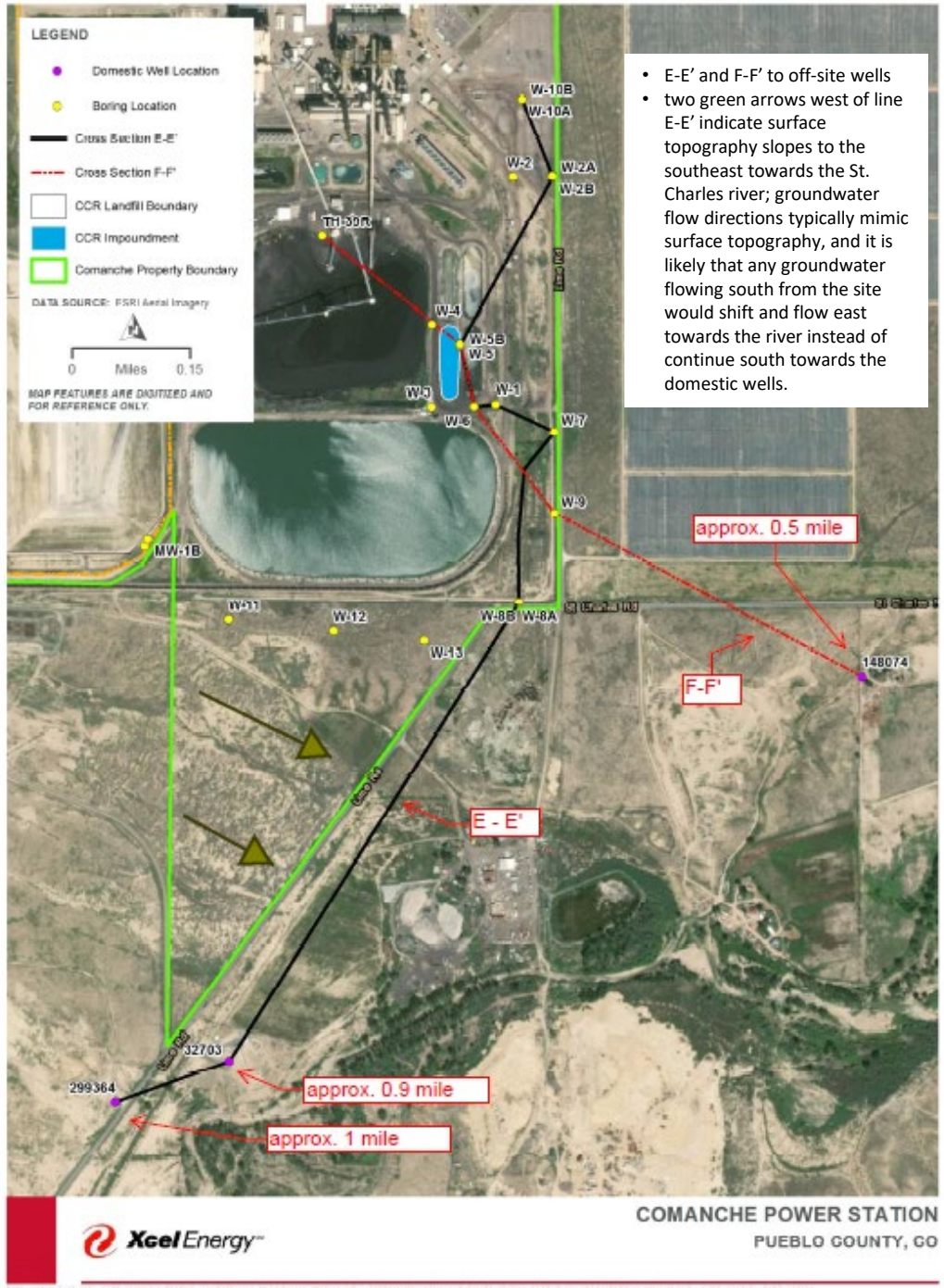
Comanche Station
Bottom Ash Pond Discussion
April 13, 2021

(Rev. April 19, 2021)



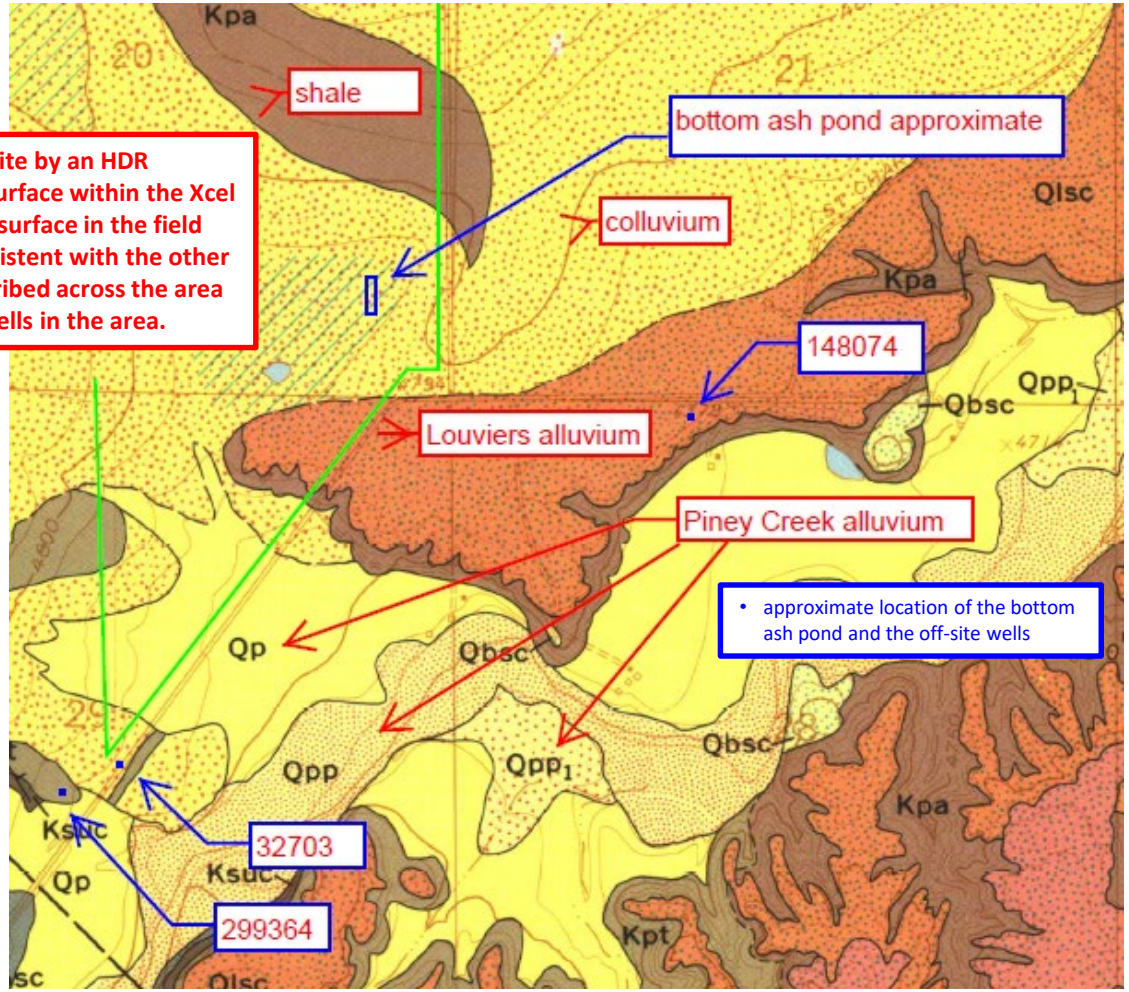
- bedrock high in SE corner
- gradient north of the landfill reflects MW-3 and MW-5 as upgradient wells; used for BTVs at the landfill



- E-E' and F-F' to off-site wells
- two green arrows west of line E-E' indicate surface topography slopes to the southeast towards the St. Charles river; groundwater flow directions typically mimic surface topography, and it is likely that any groundwater flowing south from the site would shift and flow east towards the river instead of continue south towards the domestic wells.

Off-site well approximate locations
Regional Surface Geology Map, Scott 1969

- **The Scott 1969 USGS geology map was reviewed on-site by an HDR geologist. The polygon of Pierre Shale shown at the surface within the Xcel power station project boundary was not observed at surface in the field (area of W-5 and W-2A), and that area appeared consistent with the other surface material observed at the site [colluvium described across the area (Qc)], and with the drilling observation in all of the wells in the area.**



- **Note that this is a zoomed in section of the much larger regional map with significantly different scale. Also, since this is surface geology, the lithology from the well logs is what is reflected in the two cross-sections.**

Cross-sections E-E’ and F-F’

- Limitations in extrapolating the lithology between the on-/off-site wells
  - No data points between on-site wells and off-site wells located approximately one-half mile and one mile away
  - Significant differences in drilling type and detail in well logs between on and off-site wells
  - Differences in dates/vintage re: the depth to groundwater shown in the off-site well logs
  - Groundwater elevations in the off-site wells are estimated based upon rough surface elevation taken from Google Earth; the water elevations in on-site wells are based on well survey
  - Lithology used for cross sections on right side of the figures are from professional geologist logged core drilling completed by HDR, water levels from Jan 2021.
  - Lithology and water levels for wells on the left side of the figures are from driller logged mud rotary drilling on CDWR Well Permit Database (1967 and 2015).
  - Driller logs described only “shale”, so it is not known whether that is consolidated shale or weathered shale, an important distinction for groundwater flow.

Comanche Station Cross Section E-E'

South

North

W-10B WBR

W-2A WBR background well

BAP original wells perched water

W-8A southeast

W-7 and W-9 WBR eastern perimeter

Bottom Ash Pond

DRY

DRY

Lithology from driller logged mud rotary drilling on CDWR Well Permit Database, water levels from well log (1967 and 2015)

299364
2015

32703
1967

Topographic low, groundwater flow likely SE towards the river

screened alluvium

screened primarily in alluvium

Clay

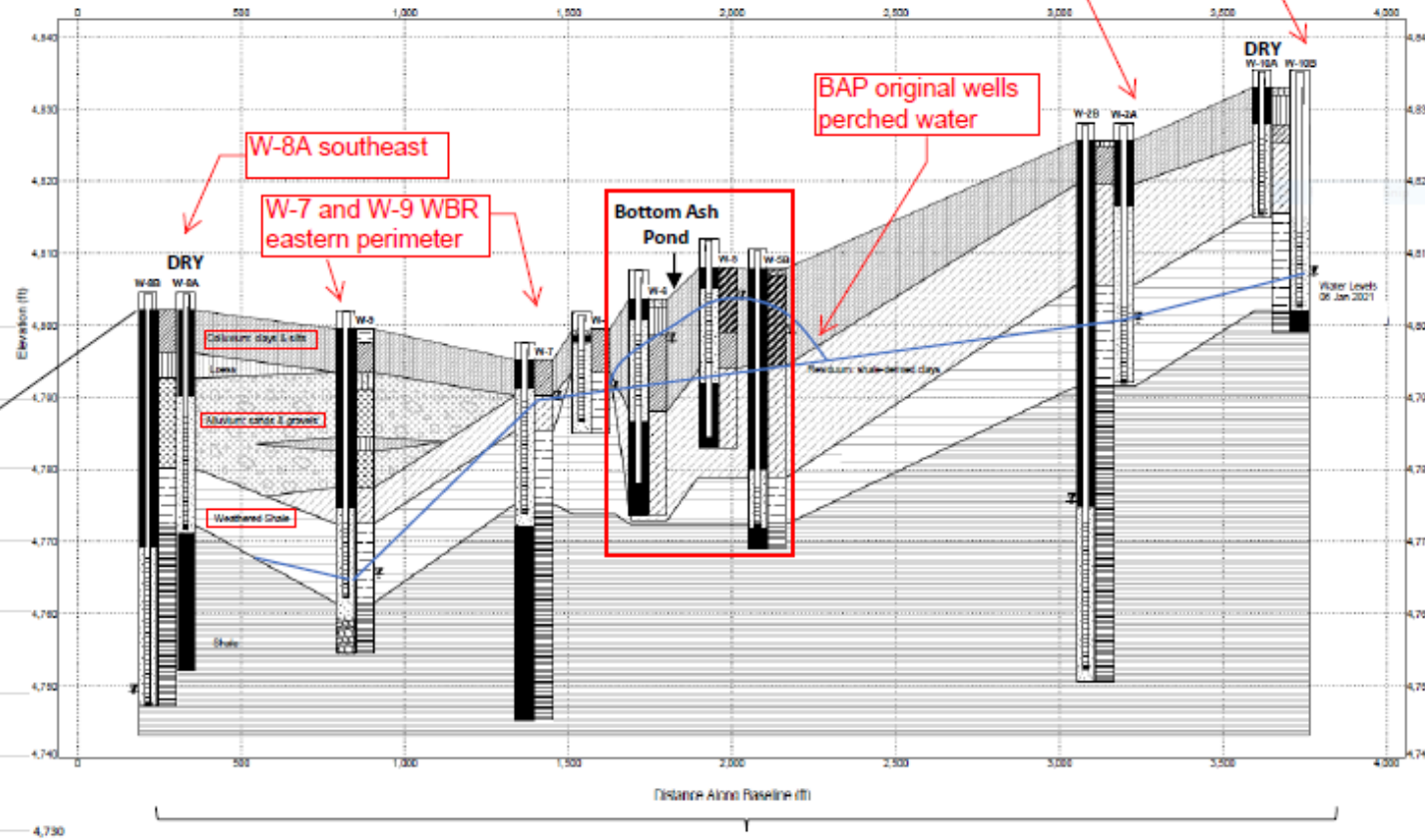
Shale

Sand, gravel, rocks, boulders

?

?

Not to scale

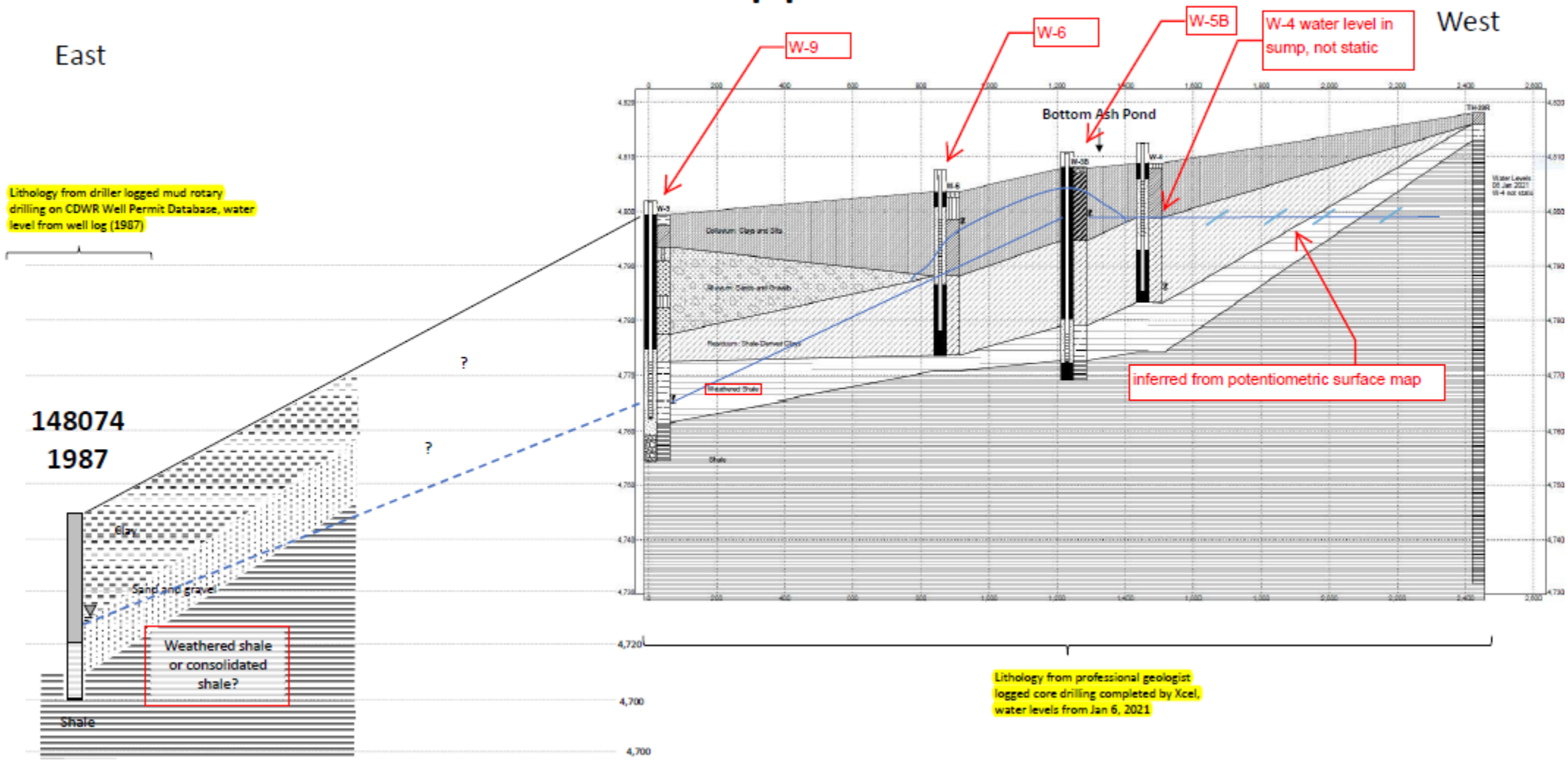


Lithology from professional geologist logged core drilling completed by Xcel, water levels from Jan 6, 2021

Comanche Station Cross Section
F-F'

East

West



Groundwater Chemistry

- Limited SSI's in colluvial wells near bottom ash pond which intercept perched water
- Newly installed wells are dry in the colluvium and screened in the weathered bedrock
- Groundwater in the weathered bedrock is the relevant groundwater for monitoring
- Water chemistry in weathered bedrock less than BTVs
  - W-5A: near the pond
  - W-7 and W-9: downgradient of the pond at the eastern property boundary, and
  - MW-11 and MW-12: south of the raw water pond
- Only exception is pH which is not unique to the bottom ash pond
- Groundwater results indicate no off-site impacts after decades of pond operation.

Data Support Lack of Hydrogeo Connectivity

- Despite limitations in extrapolating the E-E’ and F-F’ cross sections
  - Impacted groundwater is in colluvium adjacent to the bottom ash pond
  - New downgradient on-site wells are dry in the colluvium
  - Perched colluvial groundwater is not moving off-site
  - Off-site wells intercept alluvial groundwater
  - Weathered bedrock lies stratigraphically below alluvium
  - Groundwater transport in the weathered bedrock is estimated at ~ 35 ft/year
- Given the dry colluvium at property boundary, absence of groundwater impacts in weathered bedrock, the stratigraphic position of weathered bedrock relative to alluvium and rate of groundwater transport over the distance to off-site wells, the potential risk to these wells is considered extremely low

Bottom Ash Treatment System Update

- On-track to meet schedule proposed in March 24th letter
  - Mid-June temporary system
  - Mid-August pre-packaged system
- Outage and sluice line tie-in underway
- Temp system major equipment in place, being connected
- Bunker zone 4 to be complete and tested end of April
- Pumps and valving long lead items continue to drive in-service date

Discussion